THE DOCTRINE OF DARWIN.*

By Theodore Gill.

The chief for many years of the leaders in science knows no longer the world he erstwhile knew so well. Charles Darwin has closed a life illustrious in the annals of biology, scarce full of years but very full of honors.

How fruitful was that life and how potent its influence on philosophy and on sociology the united voice of the civilized world proclaims—how grievous the loss the lamentations of mankind testify. Less than a quarter of a century has elapsed since the publication of the "Origin of Species by means of Natural Selection." How great is the contrast between the beliefs and practice of naturalists before its appearance and those of their present successors! He would, indeed, have been a bold man who would have predicted that, in two decades after its appearance, the views therein promulgated would be universally accepted and be taken as the recognized platform of biologists. But the incredible has actually happened; all the students of nature, and in every land; zoologists and botanists, palæontologists and geologists—in America and Europe, at the confines of Asia, the extreme of Africa, and in distant Australia—all meet on common ground as evolutionists; all recognize to a greater or less extent the operation of natural selection in the survival of the fittest. To appreciate the cause of the profound impression produced by the deceased naturalist's greatest work, some reference to the antecedent and succeeding conditions is fitting.

It had been, from time immemorial, a generally accepted idea that the living beings which people the globe had, in some mys-

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terious manner, been each "created" separately; but how, few ventured to express in words, for the mere attempt to do so conjured up such strange fancies that the intelligent mind drew back in revolt and refused to consider them. Now, it is a recognized scientific creed that the animals and plants which have successively inhabited the earth, were the descendants, with modification, from previous inhabitants since the dawn of life. A glimmer of the truth had now and then occurred to contemplative students. Philosophers had ventured to think that living forms like ancient ones might have descended from them. The investigators in various departments of biology had gradually deduced generalizations which all tended in a similar direction. The taxologists, in their very nomenclature, compared the animal kingdom to a tree of which the principal types were "branches" diverging from a common trunk, while the minor groups were successive offshoots; and the idea of genetic relationship suggested by the various degrees of likeness was expressed in the names conferred on other groups—"tribe," "family," etc. The embryologists had recognized a coincidence between the stages of development of the "superior" animals and the adults of animals inferior in the system. The palæontologists had discovered an approximate coincidence between the successive inhabitants of the earth and the successive stages in the development of the living animals of the same types. The series of facts thus obtained had even, to some extent, been coördinated.

All these series of facts were such as would have been the result of the derivation of existing types from previous ones. But the possibility that the seeming was the real did not commend itself to the consideration of naturalists. Instead thereof, it was assumed that the facts were "in accordance with a plan of the Creator;" that the Deity had conceived a few patterns, and that by those he constructed the animals which successively appeared on the globe, to be in time swept off and replaced by others. If answer was made that such was a puerile conception of creation and that it lim-

ited the power of Deity, excessive anger was displayed, and its opponents called infidels and atheists. But even those who doubted whether the accepted views of creation were tenable, hesitated to take the alternative view. An efficient factor in variation remained to be discovered, and a full presentation of the data had yet to be made.

It was in 1859 that the desiderata indicated were supplied in "The Origin of Species by means of Natural Selection." "Variation under Domestication" was compared and contrasted with "Variation under Nature." The "Struggle for Existence" which is the result of the progressive increase of living beings was considered, and "Natural Selection" was designated as the factor which determined the development and existence as "species" of forms which had descended, with modifications, from countless antecedent generations. With the successive changes in temperature and other conditions ensuing in the ever-changing world, the animals and plants which peopled it were compelled to keep pace by corresponding changes in structure, or to give place to others who could adapt themselves to the new conditions.

So much were the views thus enunciated opposed to the current ideas that a brief period of astonished silence ensued, and men felt about before they could realize their full purport, or that such opinions were broached in sober earnest. Then followed on every hand torrents of detraction and abuse. The naturalists of the old school and the priests of revelation met on common ground, and loud and bitter was the denunciation. Numerous were the arguments against the new theory.

But why this great turmoil and uproar? Darwin was not the first to believe that species had been derived and not created. So had philosophers believed before; the grandfather of Darwin believed and urged the belief; a great naturalist at the commencement of the century—Lamarck—boldly and wisely formulated a theory of evolution; the "Vestiges of Creation" took up the view, and gained marked attention in Britain. Even a clergyman of the English

Church, the Savilian professor in orthodox Oxford, the Rev. Baden Powell, in 1855, had considered the "Philosophy of Creation" in a "masterly manner," and Darwin bore testimony that nothing can be more striking than the manner in which the enlightened priest showed that the introduction of new species is a regular phenomenon in contradistinction to a miraculous process. Darwin was not the first even to conceive of the principle of natural selection. An American resident in England, Dr. W. C. Wells, as early as 1813, had recognized the operation of the principle in the distribution of the human race. In 1831, Patrick Matthews also appreciated the principle of natural selection; so Darwin himself witnesses.

It was not, then, the mere enunciation of the theory of evolution, nor of the principle of natural selection, that characterized the "Origin of Species," and drew the attention of mankind to it. It was the recognition of the incessant and universal operation of the factors, the masterly co-ordination of the facts of biology—zoology, botany, anatomy, general morphology, physiology, embryology, palæontology—and geology, the marshalling in orderly array and concentration in one direction of all natural knowledge, the force of the logic, the clearness of the exposition, the judicial candor of the argument that arrested men's attention, and provoked serious consideration of what before had been ignored as being beyond the domain or possibilities of investigation. In the time of Lamarck the world was not ready for a consideration of the question. Lamarck's was the prophesy of intuitive genius—genius the greater in that the facts that had then been garnered were few. The "Vestiges of Creation" was so replete with errors of fact and misconceptions as to attract more attention to the fault of its details that to the logic of its argument. The principle of natural selection had been applied to very special fields by Wells and Matthews; no evidence had been furnished of its wide extension, and it even occupied a subordinate position in the thoughts of those investigators.

The author of the "Origin of Species" was a different man from

his predecessors, and lived in a happier time. The facts had been accumulated and co-ordinated; men were ready to consider the reason why facts were such, and none was better fitted than Darwin —I should rather say none was so well fitted—to arrange and present the facts and to draw the deductions therefrom. Ever a close observer, practiced in many lands, student of all nature—especially skilled as a geologist, a botanist, and a zoologist—endowed with a severely judicial mind, honest above all, none like him had ever grappled with the mystery of creation. For more than twenty years he had pondered on the subject; with impartial severity he had weighed the evidence. He was, perforce, led to the conclusion that all the living had been derived from past forms, with modifications incident to individuality; the sums of the divergencies, small in themselves, became large in the aggregate, became enormous in time. The increasing beings, crowding upon each other, invading each other's domains, struggled for the life into which they were born. Happy were those possessing some slight advantage—strength, swiftness, dexterity, or adaptability resulting from modification of structure—for they could procure place or food at the expense of their competitors, and the characters that gave them victory secured, likewise, the temporary ascendancy of their kind. How great is this variability our domesticated animals attest; how ancient is our globe geology teaches; that the race is to the strong or the cunning observation of inferior nature assures. With known variability, time, and space, what could not result? Which, then, was the more probable that Nature—or, if you will, the Creator—had always operated under law, or that there had been constant interference?

Thus were the issues fairly joined. On the one hand, Creation was the rallying cry; on the other, Evolution and Darwin. But what meant the opposed terms? It is surely but reasonable to ask the question. The evolutionists conceded the reasonableness, and gladly accepted the ordeal. Could less be required of the creationists? In reverential mood would I submit the alternatives. If they repel, blame not me. I have long and fruitlessly searched for better.

Creation implies the actual fashioning of forms in full panoply, and with all the characteristics of their kind. But when it was asked how this had been effected the answer was vague and evasive. Did "elemental atoms flash into living tissues?" Was there vacant space one moment and an elephant apparent the next? Or did a laborious God mould out of gathered earth a body to then endue with life? The questions are surely pertinent, for only by such means can we conceive of creation. But passionate disclaimers and angry denunciations greeted him who would frame such conceptions in exact language. Metaphysical jargon and rhetoric about divine purposes might sophisticate, but could not answer.

Evolution denotes the derivation of living beings from preceding in endless succession. Variation in progeny, limited heredity, and time are its correlatives. These being conceded, the peopling of the globe with its life, past and present, is conceivable.

What was the evidence to support the conflicting conceptions?

For creation it was urged that the universal consensus of mankind supported it; that divine revelation taught it; and that the diversities and specialization of organic forms forbade the idea of their derivation from a common parentage.

The universal consensus of mankind maintained till the sixteenth century the doctrine that the earth was flat; that the sun and other planets circled round the earth; and that the earth was the great centre of the universe. The universal consensus of mankind for thousands of years is not the universal concensus of the enlightened man, nor of the present century.

The teachers of revelation have been often mistaken. Many are they who once were contemned and denounced because their utterances were not in accordance with the opinions of their day, who are now accepted as the champions of a purer religion. One of the wisest priests of England has said that "with a certain class of religionists every invention and discovery is considered impious and unscriptural as long as it is new. Not only the discoveries of astronomy and geology, but steam, gas, electricity, political economy,

have all in their turn been denounced; and not least, chloroform. Its use in parturition has been anathematized as an infraction of the penalty pronounced on Eve!"* It is not I, but a great clergyman, who expresses such sentiments.

The objection that the differentation and specialization of organic beings gainsay their derivation from a common source is a most weighty one. In the infancy of our own knowledge it was unanswerable, and the less we know of nature the more we are impressed with these diversities. It is not, however, simply a question of whether evolution is true; but which is the more probable of two alternatives—that all the phenomena which point in one direction and which could have occurred in natural sequence, have taken place in such sequence; or that direct creative intervention has ensued again and again, when the same ends could have been produced without such intervention.

Nature was true to her disciple, and herself furnished the replies.

It was contended that if evolution were true, the evidence should be forthcoming in the existence in previous geological epochs of forms of a generalized character intermediate between still earlier ones and later widely separated forms; and that of such there were very few.

The graves of the distant past gave up their dead, and the ossuaries of our own far West yielded most cogent testimony to the truth. Forms from the eocene and later beds, resurrected by the wand of the anatomist, rising in successive lines behind the wide gaps in the living files, proclaimed that all were of one blood, and showed the genealogy of the contemporaries of man.

Many were the forms thus connected. Few are those that may be mentioned on this occasion. The horse-like animals, the rhinoceroses, and tapirs are so unlike, that proof of their derivation from one source might be thought to be impossible. But as we go back into the ages we find equines with lateral digits and hooflets

*Rev. Baden Powell's Essay on the Spirit of the Inductive Philosophy, etc., p. 455.

becoming larger and longer, teeth shorter and more generalized, skeletons less characteristic; rhinoceroses with cutting teeth, and more slender forms; tapir-like animals without the peculiar tapirine teeth, with rhinocerotoid skulls, and with otherwise modified structure; all these accompanied by innumerable other modifications, till finally we are almost at a loss to tell whether it is a horse-like, a rhinocerotoid or a tapiroid animal that is before us, and *they* become lost in earlier forms with special characters of their own. And as we go still further back we are confronted with still other forms that are connected by series projected backward from the ruminants and from the elephantids. We do, in fine, know the genealogy of our own contemporaries—imperfectly it is true, but still we know it.

It was objected that animals were segregated by such very wide intervals that they must be isolated in different branches, and that there could be no community of structure between such branches; they expressed fundamentally different plans of structure.

One by one zoology, anatomy, and embryology supplied the links between the old branches; the branches were at length completely uprooted, and it has even become a matter of simple convention what should be considered major groups. Plans of structure can no longer be claimed to be peculiar to different types.

That branch of which man is the primate—the vertebrates—was supposed to be perfectly unassailable and isolated; but zoology and anatomy have revealed to us amphioxus, and embryology the earlier stages of the tunicates. The evidence is now conclusive that these forms which once appeared to be among the most distant are now the most closely related. The affinities of the tunicates with invertebrates are evident, and thus we may look far back to that time when vertebrates did not exist, but when the common ancestors, from which they and the related invertebrates should diverge, held sway.

It was even pretended that the evidence was insufficient to show that variation was possible or could be propagated.

From every hand testimony was forthcoming. The breeder could

point to every domesticated animal—the horticulturist and pomologist to all cultivated plants—the systematist and zoögeographer to the limits of species which varied with knowledge of their distribution—the palæontologist to the gradation between the extinct forms and widely separated living species, as well as to that between forms which lived in successive earlier epochs.

It was urged that the Darwinian theory was opposed to revelation, and subversive of Christianity.

As students of nature and seekers after truth alone—so far as nature is concerned—we only ask whether the views of Darwin are true or not. But now, from many a pulpit, and from the most enlightened of the clergy, we hear the claim that evolution is in perfect accordance with revelation, and is a witness to the power, prescience, and goodness of God.

It was contended that acceptance of the teachings of Darwin would have a pernicious tendency, and entail riot, lawlessness, and crime in the world.

A long life of singular purity and blamelessness in the person of Darwin was an answer. An unsullied heritage from an ancestor entertaining like views has been transmitted to heirs of his body without flaw. Sons of the great philosopher continue the studies of their great sire, and worthily wear the heavy mantle left to them.

One after another the scientific opponents of evolution became convinced of its verity, or died out. The naturalists of a new generation with one accord accepted "Darwinism" as a starting point for their more profound studies. The methods and aims of biology became changed. Biology became exalted from empiricism into a science. Long before "The Origin of Species" had even "come of age," acceptance of its teachings had become an essential of scientific creed, and Darwin was acknowledged to have effected a greater revolution in science than any Englishman since the time of Newton. Most meet was it then that he should rest by the side of his great predecessor whose rival he will ever be in fame.